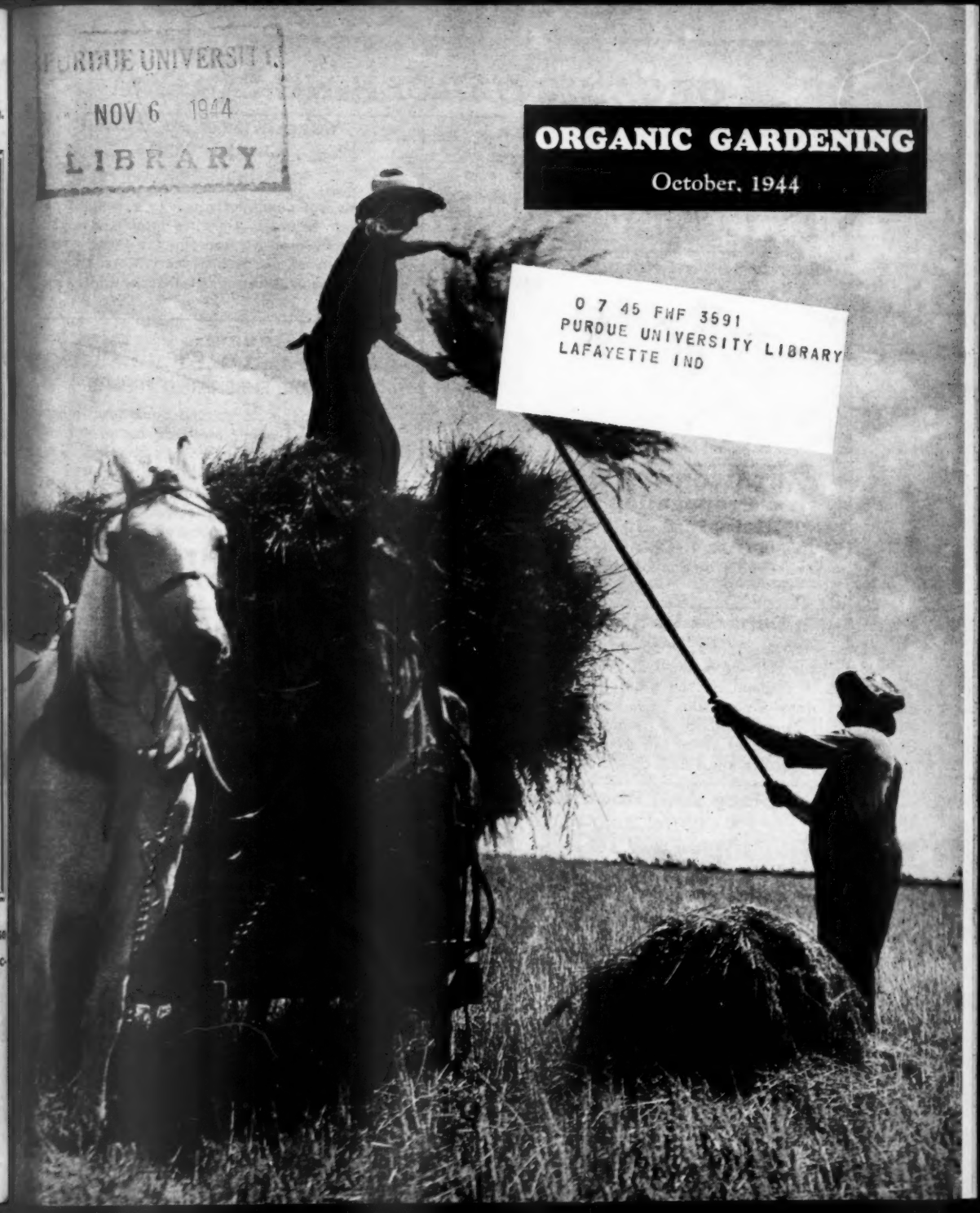
PURDUE UNIVERSITY
NOV 6 1944
LIBRARY

# ORGANIC GARDENING

October, 1944

0 7 45 FHF 3591
PURDUE UNIVERSITY LIBRARY
LAFAYETTE IND



# ORGANIC GARDENING BOOKS

## COMPOST — How To Make It

A pamphlet of 64 pages answering many questions about the best way to make compost. This book consists of material that has appeared in Organic Gardening from time to time. **.25**

## Gardener's Companion Cards

A set of 40 cards, each one representing a different vegetable, printed with uniform paragraph groupings so that you know where to look on each card for any kind of vital information you need in a hurry.

Take the card right with you into the garden. Will fit in your pocket. Handsomely boxed. Makes a splendid gift.

For Medium Northern Climate. **$1.00**

## EARTHWORMS — Their Intensive Propagation and Use in Biological Soil Building

BY DR. THOMAS J. BARRETT,
an authority on the breeding of earthworms.
**$1.00**

## 3 Debates in House of Lords

A pamphlet of 55 pages which gives in complete form the two thrilling debates held in England on the advisability of forming a Royal Commission to check on the Sir Albert Howard method of farming and gardening. It is chockfull of amazing information and reads like a novel. . . . . **.25**

## Sleep And Rheumatism

A CLOTHBOUND BOOK
Written By J. I. Rodale,
Editor of ORGANIC GARDENING

Mr. Rodale, always interested in natural methods of obtaining health, has made a startling discovery regarding pressures we exert on parts of our body during sleep, which cause stubborn conditions of neuritis in the fingers, arms, shoulders and neck.

Miraculous cures have been obtained by persons who have followed the simple rules explained in this book. **$1.50**

## Vegetable Mould And Earthworms

BY CHARLES DARWIN

This is a pamphlet which represents a condensed version of Darwin's famous classic on the earthworm. It contains the most important parts of his revolutionary work and is a MUST for every organic gardener and farmer. **.25**

## Bio-Dynamic Farming And Gardening

BY DR. EHRENFRIED PFEIFFER

A 240 page clothbound book describing in full the Bio-Dynamic methods, by an acknowledged authority. Some of the chapters are:

The farmer of yesterday and today
The soil, a living organism
The load limit in agriculture
The treatment of manure and compost
How to convert an ordinary into a bio-dynamic farm., etc., etc.

**$2.00**

## Grow A Garden

AND BE SELF-SUFFICIENT

By Dr. Ehrenfried Pfeiffer and Erika Riese

A cardboard covered book of 118 pages with many beautiful illustrations and garden plans. Written from a practical background of many years of actual experience.

Gives detailed instructions for growing each vegetable from the bio-dynamic point of view and is a gold-mine of information of untold value to the home gardener. **$1.25**

## Plowman's Folly

By Edward H. Faulkner

While we do not quite agree with Mr. Faulkner's main theme we believe this to be a valuable book which should be read by everyone interested in organic farming and gardening. There is much interesting material in the book showing how to increase the humus content of soils. **$1.00**

THESE PRICES ARE POSTPAID — FOREIGN ADD 25c PER VOLUME.

**ORGANIC GARDENING — Emmaus; Pennsylvania**

ORGANIC GARDENING

Emmaus, Penna.

Vol. 5, No. 5. Oct., 1944 $2.00 a year 25c a copy

J. I. Rodale, Editor — Sir Albert Howard, C.I.E., M.A., Associate Editor

**Table of CONTENTS**

With The Editor
The Insect Menace And Plant Disease ..... 1
Manure and Muskmelons 8
Soil Worker and Compost Turner ..... 10
"Micromen" of The Soil 11
Announcement to Farmers 14
Hints For The Victory Gardener ..... 15
Chemical vs. Organic Fertilization ..... 16
Is Basic Slag Really Necessary? ..... 21
Stacking Beans ..... 23
Growing Herbs in the South ..... 24
Sunflower Seed Notes .... 26
The Regulation of the Compost Heap ..... 26
Reader's Correspondence 27

# With The Editor

## The Insect Menace And Plant Disease

IN order to cope with the problem of plant diseases and their relation to microbes and insect infestations it would help a great deal if the farmer and gardener would try to study cause and effect. First of all, what causes plant disease? The major part of the blame is placed on bacteria, fungi and other microscopic disease-producing organisms. Do these organisms directly bring about the disease? The answer probably is *yes,* but then the question arises, *why do these organisms attack certain plants and leave others alone?*

It is the same with a human being. Take the mouth of an average person, even after he has cleaned his teeth. It is a very filthy place, teeming with billions of bacteria. When your resistance gets low some of these germs or viruses will give you a cold. Other people harbor these self-same disease-causing organisms and rarely if ever contract a cold. It is said that practically everybody carries tuberculosis germs in his body but most people never come down with the disease. The plant presents a parallel situation.

In the human body resistance is usually built up by eating a varied diet of good food. Even though our food today taken generally is more or less unsatisfactory yet a person getting a rounded out diet including orange juice, grape-fruit, etc. is more healthy than others who live on an unbalanced dietary. The food of the plant is in the soil. You might say that the soil represents the intestines of the plant, predigesting its food before ingestion through the roots. This book has shown that the best food for the plant is plenty of organic matter in the

Read Magazine, Inc. Executive and Editorial offices, 6th and Minor Sts., Emmaus. Penna. Subscription rates 12 issues for $2.00. **ORGANIC GARDENING,** published 12 times a year by Read Magazine, Inc., 6th and Minor Sts., Emmaus, Penna. Entered as second class mail at the postoffice at Emmaus, Penna., under the act of March 3, 1879. Printed in U. S. A.

soil which builds up its health and gives it the ability to ward off disease.

It was shown that bacteria, fungi, earthworms, etc. play a prominent part in breaking down this organic matter and preparing it for the roots; it has been demonstrated that the use of strong chemicals inhibit the action of these microbes; that in some cases practically no organic matter is used, dependence being entirely on chemical fertilizers. In such cases the plant is not healthy.

Professor Waksman in Humus (Williams and Wilkins) says, "Plant deficiency diseases are usually less severe in soils well supplied with organic matter, not only because of the increased vigor of the plants but also because of antagonistic effects of the various soil micro-organisms which become more active in the presence of an abundance of organic matter."

An example of this is contained in an article by Charles Drechsler entitled *Predaceous* Fungi, in the Biological Review (1941 pages 278 and 290) which is commented on by Lady Eve Balfour in the *Living Soil.* She says, "No less than fifty-six different species or forms of fungi have been recorded by mycologists as 'subsisting by the capture of motile animals' . . . . of these fifty-six forms, twenty-five are known to capture and consume nematodes, twenty-three kill and eat amoebae, five live upon rhizopods and the remaining three species are aquatic.

"The methods by which these fungi trap their prey vary. The majority of the nematode eating species form loops or bales of mycelium, which also usually excrete an adhesive substance. When an eelworm crawls through these bales, they close round it, holding it captive despite its violent struggles which may last for as long as two and a half hours."

These predaceous fungi become more active in the presence of organic matter on which, in some manner they subsist. Organic matter, therefore, not only gives the plant health directly but is an important part of the soil cycle of life by being indirectly responsible for removing dangerous disease organisms in the soil before they can do their destructive work.

In the West we have a terrible situation of plant diseases which afflict the farmer and gardener. In the Orient there is very little disease because stable manure and composts are used liberally. They confer strong disease-resistance to the plant. A minimum of chemical fertilizers are employed.

In *The Rhodesia Herald* of Sept. 4, 1942 there is published a confirmation of the value of organic matter in giving plants health. The following is an extract:

"Some years ago Mr. S. D. Timson, Assistant Agriculturist, noticed a garden in which the vegetables were strong and the flowers bright and vigorous. He was surprised to learn that three years earlier cultivation had been almost abandoned because of the heavy infestation of eelworm. The excellent conditions he saw followed a good dressing of compost.

"He immediately began to observe the results of compost in regard to eelworm, make practical tests and induce farmers to experiment. Once the inquiry was begun evidence began to pour in.

"At Darwendale, Mr. O. C. Rawson had applied five tons of compost per acre to infested tobacco land. In the first year there was a reduction of eelworm, and in the second year, without a further application, the eelworm disappeared. Other tobacco farmers began to report similar experiences. . . The compost, of course, was applied for its fertilizing value, and the consequences on the eelworm population were a surprise.

"It now seems that the same effect has been noticed in other countries where compost was being tested out. In Ceylon, members of the Department of Agriculture were able to report last year that the most promising method of ridding the soil of eelworms was one they had only recently discovered. It had been found that if large quantities of organic material, such as compost, green manure, or cattle manure, were added to the soil the population of eelworms was greatly reduced. Examining into the causes of this effect, their conclusion was that it was due to the increase in the soil, following the addition of organic matter, of organisms like fungi, and insects and other nematodes which preyed on the eelworm. . .

"From Ceylon it is also reported that as research work on plant diseases progressed it was becoming increasingly evident that many of the soil-borne diseases of that island would not be so severe if more care were taken to increase the amount of humus and organic matter in the soil.

"Plants grown in well-cultivated soils, well supplied with organic matter, are not affected by many plant diseases to the same extent as those which are grown in the poorly-cultivated unmanured soils."

In a previous issue we gave information from an article in Country Gentleman by Doctor J. Sidney Cates showing that root-rot disease in cotton was absolutely eliminated by the simple expedient of applying stable

manure. Much of our cotton is grown with a 100% chemical fertilizer application due to a one-sided monoculture. The curbing of the root-knot parasite on Hawaiian pineapple plantations was accomplished in the same manner—substantial use of organic matter. Every farm regardless of its specialty should be a balanced agricultural unit, including livestock to furnish manure.

Sir Albert Howard wrote in Organic Gardening in 1942, "I should like to quote my own experience at Blackheath. In 1934 I purchased a house, the garden of which was completely worn out through no fault of the previous owner. It was a veritable pathological museum—the fruit trees, in particular, were smothered with every kind of blight. Steps were taken to convert all the vegetable wastes into humus with the help of stable litter. Even after one year the pests began to retreat. In three years all had disappeared, the wooly aphis on one apple tree being the last to leave. During this period no insecticides or fungicides were used and no diseased material was ever destroyed. It was all converted into humus.

"One further interesting result must be mentioned. I grew in heavily composted soil a collection of Royal Sovereign strawberries, badly infected with a common virus disease, alongside some healthy stock. This year, 1942, the strawberries raised from these two sets of plants were about the best I have ever tasted. I found no trace of the virus disease. Similar results have been obtained by several of my correspondents."

Lady Eve Balfour in the Compost News Letter, writing about her experiences with six acres of vegetables, said, "You know what a difficult season it has been for that class of crop, what with the drought, the fly, and the caterpillar.

"My seedlings were grown on fertile soil, and were planted out on the ridge, compost being first put under the ridges. The weather was dry when they were put out, and in a short time all the plants were badly attacked by, first fly, and then caterpillar. I thought I had lost the whole crop; but I did nothing about it. In a few weeks, when the roots reached the compost, the plants began to recover, and, despite no rain, they not only grew well, but began to master the pests. About six weeks ago you could see, side by side, the completely recovered and the partially recovered and a few still badly attacked. Now, you would hardly believe that there had been a caterpillar or a fly in the field. My buyer says they are the cleanest greens he has seen anywhere this year. The flavor is superb, and the color has been good throughout. He himself has lost all his cauliflowers and most of his cabbages; and has spent a fortune on sprays and insecticides. Result: he is the latest convert to compost. I have often grown these crops on farmyard manure without artificials; but, even if otherwise healthy, they have always before been bothered with fly in a dry season.

"What interests me so particularly about this experience is that the crop was attacked and recovered, without any treatment. I find this more impressive than if they had not been attacked.

"Always yours sincerely,
EVE BALFOUR.

"P.S.—I forgot to say that I also have an absolutely healthy crop of onions grown with compost. This is also unique this year round here."

When insects come to ravage plants it is easy for the gardener to get out his spray-gun and saturate his garden with lethal fumes—lethal for the bugs and also for the helpful bacteria and earthworms in the soil. You can't blame him because he has been systematically propagandized by many experts and comes to believe that it is the best thing to do. Here again we are following typical medical procedure.

Nature, however, generally can be depended upon to have a reason for her way of doing things. We don't put poison spray on bees. We know they are beneficial. Do all other insects serve some particular function in Nature's general scheme? Insects are not the cause of plant disease. They are an agency of Nature to point out that something is wrong with the plant—either it is imperfectly grown or the soil is not properly fertile, etc. Nature has evolved parasites and insects to remove unhealthy plants, artificially fertilized. It is part of her scheme for the perpetuation of the species.

The operations of Nature work out in as near perfect a manner as is practical in the involved and complicated world of soil, plants and man. The processes of decay set in as soon as organic matter dies. When a leaf is on a tree it blooms. Just let it fall off and it begins to decay, with the aid of a host of Nature's helpers such as bacteria, fungi, etc. The same thing applies to a cat or a fish or any living matter. Can you conceive of a world where matter cannot decay? Things would soon pile up into an unwholesome mess.

Now take that very same leaf on that tree. Sometimes a blight hits it. It seems to start decaying before it is dead. Or it may be eaten up by some insect that

does not seem to eat leaves from other trees of the same species. When you study into it you will find that the tree is sick. Isn't sickness the beginning of death, the beginning of the processes of decay? Have you ever dumped table garbage on the ground or in a hole? In a day or so the maggots come to work on it. This is an invariable rule of Nature. The maggots will not feed on live matter. And by and large and in the same way, insects prefer diseased tissue. Nature has trained them to have a perverted taste. They do not relish the taste of a healthy plant.

Nature does not want to perpetuate the species by using chemical fertilizers. When a plant grows with the aid of chemicals, Nature knows that in the long run that plant through its progeny will eventually die out. How does Nature know it? It is part of an incredible system of evolution—trial and error practiced over millions of years.

We had an experience with Japanese beetles and some grapevines that illustrates this point. When we purchased the farm we inherited a very old grape vine which was stripped by these beetles every year. Last year we planted a young new vine near the old one. We put in a good application of compost and a heavy mulch under each vine. The leaves of each twined together, yet the beetles still worked only on the leaves of the old vine. They left the new plant alone even though the leaves were right in among the others. Here or there could be seen a little bite, but evidently one taste was enough. The chances are that the old vine was too far gone to rehabilitate, even with compost. Or perhaps it might take two or three years to revive it. We shall see. But in the meantime, the Japanese beetle can distinguish in its taste between two kinds of leaves of the same plant. The new vine is young and responded to humus more quickly than the old one.

Old farmers will tell you that they had much less troubles from insects and plant diseases when they were young. I have asked dozens of them and always get the same answer. It seems that insect infestation and plant diseases are concomitants of the chemical fertilizer era. The potato blight developed into a major problem just about the time that strong chemical fertilizers came into general use. The Dept. of Agriculture of Great Britain has condemned the use of ammonium sulphate as productive of fungus diseases in plants grown with it, yet this is a very popular fertilizer in this country.

F. C. King writing in the book *The Compost Gardener* (Titus Wilson, Kendal, England) says, "Sulphate of Ammonia often produces serious and lasting results. There is a distinct connection between plants grown with the help of sulphate of ammonia and certain plant pests. The use of this artificial is recommended for leafy crops and it is a significant fact that where it is used club root and gall-weevil will be found."

He said further, "A gardener whose Cabbages were not doing well gave his plants a sprinkling of nitrate of soda, to which they duly responded; later the whole crop was ruined by caterpillars. The Cabbages in a nearby garden which received no nitrate of soda were not affected by caterpillars, although both sets of plants came from the same seed bed.

"Wood pigeons seldom attack young plants of Cabbage, Cauliflower or Sprouts if they are healthy, but will choose any that are infested with club root, gall-weevil, or plants suffering from a check due to faulty transplanting, particularly if they have been artificially watered after planting."

You never have perfection in Nature. You will always have some insects. We grow potatoes in an organically treated soil yet we do have some potato bugs, not many. There is no use getting excited and tearing our hair out over a handful of potato bugs. They do very little harm, much less by far than the polluting of the plant and soil with poison sprays. A thing to really get excited about is a new potato disease that recently attracted national attention. Roger W. Smith in an article in Organic Gardening said with regard to it, "It consisted simply in the formation of a hollow tuber. Unfortunately, this hollow tuber made possible a new focus of infection for other more virulent diseases.

"Much investigation followed its discovery, and although it has not been openly admitted there seems little doubt that the growth of these faulty potatoes was caused by 'improper moisture conditions.' Actually, this really means that the potatoes were grown in poor soil and their growth encouraged by the use of large quantities of artificial fertilizers and floods of water. You realize instantly that potatoes 'blown-up' to such an extent that their centers were hollow could have little actual food value."

In connection with plant diseases one is often cautioned to burn up diseased plant residues to prevent its infecting new crops but Sir Howard advises that if properly composted it may safely be used again on the land. In an article in Organic Gardening he said, "A few years ago Mr. A. R. Wills, of the Tadburn Nursery, at Romney,

Hampshire, found that the use of chemicals in his tomato houses led to wilt disease. Three houses —three acres in extent—became badly infected. On my advice he composted the diseased haulms of these three acres, applied the compost to the same houses and grew a new tomato crop. This was free from disease. He then took up the Indore Process and gave up the use of artificials. His nursery has never looked back. It now enjoys a high reputation for quality and there is a great demand for the produce."

Another important factor in growing disease-free plants is a properly aerated subsoil. Writing on this point in the May 16, 1942 issue of *The Gardener's Chronicle* (England) Sir Howard says, "In the leading article in the issue of *The Gardener's Chronicle* of March 21, the suggestion is made that the eelworm may not be the real cause of one of the chief diseases of the Potato, but may turn out to be a symptom of soil exhaustion. This view is confirmed by my own experience of this malady in England and by what I have seen of similar diseases overseas."

In a book called *Science in the Garden* appears the following, "In India, if the soil is well cultivated, wheat is comparatively free of rust. In Jamaica, cultivation makes sugar cane nearly immune to fungi. French viticulturists know that grapes growing in loose, porous, well-drained soils suffer less from blight."

It is a well-known fact that bad drainage, which is a concomitant of a poorly aerated subsoil causes the disease of blackspot in roses. Glenn Sonnedeker in an article in Science News Letter of Nov. 7, 1942 says, "Controlling insect pests is another function of subsurface tillage. Just how effective it is, remains an open question. The answer must await further experimentation, Gordon K. Zimmerman, of the U. S. Department of Agriculture, explains."

Many other illustrations could be given but the most graphic illustration of this principle involves a case where Sir Howard was called in to witness a peculiar phenomenon. In certain cultivated plants only certain rows were attacked by aphids. On checking he found that the soil under those rows was hard-packed. For some reason, where there were no aphids, the soil was loose and porous. This shows why the use of composts permits plants to grow relatively free of disease. It creates a loose, porous soil, well aerated.

To keep a check on the natural activities of insects bird-life should be encouraged. Many farmers today are removing hedgerows, and thus increasing the size of fields so that there would be savings of time in cultivating. By destroying these wild-life and bird havens, the balance of nature is upset. The birds go elsewhere, removing a powerful curb against the abnormal increase of destructive insect life. Perhaps you recall reading about the difficulties that confronted the American soldiers in Normandy on account of the numerous hedgerows and the small size of the fields which permitted the Germans to dig in and defend themselves stubbornly. These old-world, peasant farmers knew the value of these hedgerows in encouraging wild-life and in helping in the fertility scheme.

These natural border hedges between fields are very effective in keeping the drying winds down and the temperature of the ground up. Large corporations have entered the field of agriculture and cultivate thousands of acres. The first thing they do is to cut down the hedgerows so that their tractors can operate more efficiently, but in the long run Nature hits back in the form of more destructive insects on whom there is no natural check. Then, of course, poison sprays must be used.

It seems in recent years that toads are disappearing from farms. Is it possible that the chemicalized soil is distasteful to them? After a rain they used to come up by the thousands. The toad is an extremely valuable ally of the farmer in keeping the insect menace in check.

I mentioned this fact to a friend who has a country place at Quakertown, Pa. Her eyes opened wide! "Why, that makes me think," she said. "Near our house we used to hear the croaking of what seemed to be thousands of frogs. Then one year we rented 2 acres to a man who planted two acres of tomatoes, and who used plenty of chemical fertilizer. We never heard any frogs there after that." Astounding, isn't it?

The planting of cover crops encourage multiplication of quail who nest in the tall grass. They are a factor in keeping Nature in balance. An important agent in keeping down insects is the earthworm who is known to eat insect larvae in the soil. Organic farming encourages the earthworm. Chemical farming destroys them.

Mary Leasure of The California Earthworm Farms, put nematode infected plants in cans and planted half of them with her earthworms. In a year the worm planted stock had practically lost all signs of nematode infestation while the controls were unimproved or worse than before.

The insect menace is beginning to assume colossal proportions. It is estimated that the annual

damage amounts to two billion dollars every year, despite millions of dollars spent for research. Over 4000 Government workers are continually at work on this problem. The scientists admit defeat, in that they say that large quantities of destructive insects will always be here to plague us, and that our only means of combatting them is with poison sprays. A rather bleak future.

There must be something wrong with our system of research. The trouble is that there are thousands of scientists, each one in his little cubbyhole, looking as far as the end of his nose, and perhaps indirectly affected by the chemical vested interests who spend millions of dollars advertising and propagandizing their product. What is needed is the setting up of a large Government experimental farm operated on a purely organic basis to test out the practicality of farming without strong chemical fertilizers or poison sprays. If you feel that this should be done write to your Congressman and Senator at Washington.

J. I. RODALE

# *Manure And Muskmelons*

An excerpt from the book "Muskmelon Production"

By JOHN WILLIAM LLOYD,

Professor of Olericulture, University of Illinois.

Published by Orange Judd Publishing Co., N. Y. C.

ILLINOIS experiments — Experiments in the fertilizing of muskmelons were conducted by the Illinois Agricultural Experiment Station in Union County and Marion County, Illinois. The chief objects of the experiments were to determine (1) the relative efficiency of different amounts of manure and methods of application of manure; (2) the effect of supplementing manure with commercial forms of phosphorous; (3) the effect of using a complete commercial fertilizer in connection with manure, and (4) the effect of substituting commercial fertilizer for manure, in the production of muskmelons under the soil conditions and cultural methods typical of two melon-producing regions in Illinois.

In both counties the experiments were conducted on typical melon soil of the region, that in Union County being unglaciated yellow silt loam, and that in Marion County, gray silt loam. The experiments in Union County were conducted on land that had been under cultivation for sixty or seventy years, but that, for several years preceding the experiment, had been manured and fertilized in various ways for the production of truck crops. The land used in Marion County had been cleared of timber only a few years before the experiments were started; it was thus practically virgin soil.

In both localities, the methods of culture typical of the respective regions were employed. In Union County the transplanting method was used; in Marion County the seed was planted directly in the field. This difference in cultural methods doubtless accounts for some of the differences in results at the two places, since in Union County the plants were grown for the first month under uniform conditions, and did not come under the influence of the different fertilizer treatments until they were transplanted to the field, while in Marion County the plants were subjected to the influence of the different fertilizers from the very beginning.

The results of these experiments indicate that there may be wide differences in the relative effects of different fertilizer treatments for muskmelons in different seasons. Yet, it is plainly shown (1) that under the conditions of these experiments manuring in the hill is far superior to broadcast manuring, unless a very large amount of manure can be used; (2) that a large amount of manure used in the hills is conducive to the production of a large yield of early melons, but (3) that a small amount of manure (2.25 to 3 tons per acre) carefully applied

to the hills may produce a greater net profit then a larger amount (4.5 to 12 tons per acre) applied in a similar manner or a still larger amount (16 to 20 tons per acre) applied broadcast, even though the yields may be somewhat smaller; (4) that although the highest average yield in the field-planted crop and the second highest in the transplanted crop were produced by the plants receiving manure both broadcast and in the hills, the expense of so much manure may reduce the profits to such an extent that they will be less than from some other treatment; (5) that mixing the manure with the soil of the hill, although it increases the labor of planting the crop, has no apparent advantage over applying the same amount of manure without mixing, except possibly in the case of a large amount of manure applied to the transplanted crop; (6) that the addition of raw rock phosphate to a moderate amount of manure in the hills may increase the yield of early melons, the total yield and the net profits, in the field-planted crop; (7) that the use of a complete fertilizer (consisting of steamed bone, dried blood and potassium sulfate) applied broadcast in addition to manuring in the hill, is conducive to the production of large total yields, but that the high cost of this fertilizer may render its use inadvisable; (8) that the application of this same fertilizer to the hills in lieu of manure is attended with great danger, especially to the field-planted crop, and may greatly reduce the yield as compared with no fertilizer treatment; (9) that a fair crop of melons sometimes may be produced by the use of steamed bone alone in the hills, though the results are less satisfactory than from the use of manure, especially for the field-planted crop; and (10) that on the type of soil and with the cultural methods used for the field-planted crop in these experiments, it is unwise to attempt to produce a crop of melons without the application of plant food.

In some parts of the country, particularly in the southern states, commercial fertilizers are depended upon to furnish plant food for the production of the melon crop. Their use in California is suggested where the soil is not up to normal in fertility; but it seems they have not been profitable in Colorado.

Preparation of manure—Manure for use in melon hills must be thoroughly rotted. For best results it should be ricked up in the fall in long, low piles about eight feet wide and two or three feet deep. The sides of the pile are made as nearly perpendicular as possible and the top is flattened so that rains will soak in instead of running off. Sometimes a layer of dirt about three inches deep is placed on top of the manure to help retain the moisture. Early in the spring, work is begun on the manure to put it in condition for use. The pile must be cut down and the manure turned and mixed until it is thoroughly decomposed and of fine texture. Formerly this work was done by hand with a fork, entailing a large amount of labor; now, however, some of the large growers do all this turning of the manure with a disk and plow. The pile should be worked three or four times at intervals of one or two weeks.

## *The Weeds Philosophy*

Nay, but tell me, am I not unlucky indeed,
To arise from the earth and be only a weed?
Ever since I came out of my dark little seed,
I have tried to live rightly, but still am a—weed!

To be torn by the roots and destroyed, this my meed,
And despised by the gardener, for being—a weed.
Ah! but why was I born, when man longs to be freed
Of a thing so obnoxious and bad as a—weed?

Now, the cause of myself and my brothers I plead,
Say, can any good come of my being a—weed?
If a purpose divine is in all things decreed,
Then there must be some benefit for me, a—weed!

If of evil and suffering, the world still has need
In its path of development, then I, a weed,
Must form part of that plan which in nature I read,
Though I live but to die, just for being a—weed!

—*Martha Martin.*

### SHAKESPEARE AND COMPOST

One of our friends ends a letter as follows:

"I'll close with a short quotation from Shakespeare (Hamlet, Act III, Scene IV) which goes to show that even in those days Organic Gardening was in the public mind:

"Repent what's past; avoid what is to come;
And do not spread the compost on the weeds
To make them ranker."

Sincerely,
W. W. Wheatly,
Lakeside, Calif.

# *Soil Worker and Compost Turner*

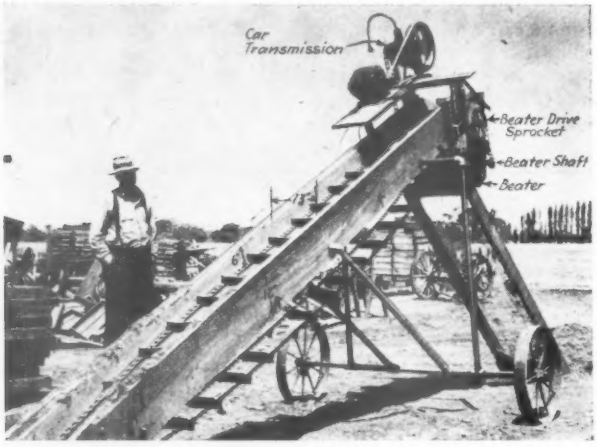
**This Elevator with Kicker Cylinder Powered by a 1½ Horsepower Motor Elevates and Breaks Up Soil, Turns Mushroom Compost Heaps, Cleans Mushroom Houses and Saves Hy Pitzen $500 Per Year. He Built It.**

By R. E. JOHNSON

Reprinted from Electricity On The Farm, November, 1943

HY PITZEN, Ohio farmer, built the soil worker shown in the accompanying illustrations as a compost conveyor for his mushroom houses. Later he found it would also handle soil, so he has been using it in all soil handling operations in connection with the starting of vegetable plants for his gardens.

Each year, at least 200 tons of manure are turned over five times in preparing compost for the mushroom house. He also handles 60 tons of dirt for mushroom growing and 100 tons or more for use in sash beds. Two men now do the job where it took four previously. And it was hard work.




Mr. Pitzen's soil worker built at a cost of less than $80. It is 13 inches wide and 16 feet long, and is made up mostly of old machine parts and No. 55 chain. It turns and beats manure for mushroom beds and soil for plant beds.

The conveyor chute consists of a trough 6 inches deep, 13 inches wide and 16 feet long. The side boards are 1 inch by 12 inches by 16 feet, with the bottom board nailed and bolted in 6 inches down from the top edge.

The conveyor is made of two strands of common No. 55 chain with special links to carry the flights. The flights are of sheet iron, 2 inches high and spaced about 10 inches apart.

The drive is from the upper end through an old Overland transmission which gives a variable speed for different operations. On slow speed the chain travel about 80 or 90 feet per minute, which is about right for two men pitching to the conveyor.

Close-up view of beater. The beater fingers are made of ⅜-inch x 2½-inch bolts. They are fastened through cross bars of ⅛ 1½-inch steel, 15 inches long, which in turn are bolted to an iron pulley 7½ inches in diameter and 5 inches face. This pulley is fastened in the center of the beater shaft. The teeth or fingers are bent slightly backward, opposite to the direction of rotation, to get the desired action.

Turning a 35-ton rick of manure for mushroom compost. Two men fork into the conveyor; the conveyor does the turning; a boy uses a sprinkling hose; and one man makes the new rick.

The framework, wheels, shafting and drive chain and gears are practically all discarded parts from potato harvesting machinery and an old binder. The illustrations show quite clearly how the framework is put together to make the machine portable.

The motor is a 1½ horsepower, single phase, 60 cycle, 230 volt, repulsion-induction motor. It is supplied with current through a heavy duty cord from a 230v. power outlet.

Attached to the upper end of the elevator is a beater for breaking up clods and manure. It is driven by the same 1½ hp motor and it, too, is home made. It has an action something like a spreader reel at the back of a manure spreader except that it is made to run more slowly so as just to shake up the compost and not shred it fine. They have tried to imitate the action of shaking a fork of manure. This beater is hinged on the drive shaft so that it can be moved away from the end of the chute to give the proper tearing action, or it may be swung entirely in the clear. Moving the beater in and out has somewhat the same effect as changing its speed.

The conveyor is used again in the summer to clean out the house. The spent compost is mixed with more soil and used for growing tomato plants or sold as top dressing for golf courses.

This is just another example of how electricity helps increase production and save labor. Mr. Pitzen says it not only saves him $500 per year but it saves him labor, which is most important, and gives him a chance to produce more. The outfit cost him less than $80 and his electric bill for all service on his farm averages only about 50c a day.

# *"Micromen" of The Soil*

By Dr. IVAN V. SHUNK

Associate Professor of Botany, North Carolina State College

Reprinted From "Scientific Monthly"

WHEN a man undertakes to grow a crop of corn, cotton, tobacco or what-not, he either knowingly or more probably unknowingly requires the services of many, many laborers. He may hire some one to plough and harrow the ground or he may do that himself. Later he plants the seed and from time to time cultivates the crop.

Let us suppose that the ploughing turns under some plant remains, cotton stalks, corn stubble, grass or weeds. The farmer tells his neighbor that this organic material will enrich the soil and aid in his next crop. He may add also some stable manure or may plough under a cover crop.

While the farmer is thus preparing and planting his soil, he is, for the most part unwittingly, letting a series of contracts. It is true that these contracts are not drawn up according to the latest legal procedure, but they are binding nevertheless. In fact they are as binding as the famous laws of the Medes and Persians.

We refer to the contracts let with the large number of different subdivisions of that great fraternity, "The Amalgamated and Confederated Order of 'Micromen' of the Soil." This great fraternity comprises all the bacterial workers who carry on chemico-biological changes in the soil. In this paper we shall mention only the bacterial fraternities and not attempt to include

other important groups, as the fungi, actinomyces, protozoa, algae and other lowly denizens of the soil.

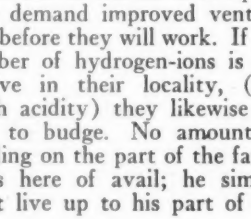
Let us refer to a number of the principal labor unions that make up this great fraternity of micromen.

First, there are the day laborers that do the rather ordinary work of tearing apart the molecules of plant and animal remains. These might be referred to as wrecking crews, and while many bacteria can break down numbers of different substances, there are certain local labor units whose contracts call for only certain types of labor.

Then there are the highly skilled or specialized workers which carry on the more specialized phases of the soil work.

Let us look first at the laborer class of wrecking crews. Here we have the bacteria of general decay, many of which are rod-shaped spore formers. Many are rod-shaped non-sporing bacteria, and there are also spherical bacteria. The main reason why these bacteria of general decay carry on is because these micromen get their food in this way. They can not eat unless they work, and in part at least their work consists of eating. A microman for instance, of the shape but not nearly the size of a hot dog, turns loose out of his body certain enzymes which digest or make soluble organic substances which the microman then absorbs and utilizes in building his body. We have been frequently told in these days of increasing social complexity that "No man liveth unto himself," a well-known biblical statement. Here let us notice that rarely does a microman live unto himself. He ordinarily absorbs soluble food that was digested by enzymes excreted by his ancestors that lived ten or more generations in the past, perhaps two to ten hours before. These micromen may come into existence, work faithfully, grow and reproduce within the short space of thirty minutes.

Even the micromen of the lower orders in the labor unions require very definite working conditions; in other words, they work under a code not unlike that of the NRA. If the soil is too cold they lie in bed and will not work. If the air is too poor they demand improved ventilation before they will work. If the number of hydrogen-ions is excessive in their locality, (too much acidity) they likewise refuse to budge. No amount of cajoling on the part of the farmer is here of avail; he simply must live up to his part of the



contract, namely, that working conditions shall reach a minimum set of requirements before any work is done.

We have spoken of proper ventilation. That is all very well for some of the unions. Others care little about ventilation and work either with or without an available supply of oxygen, while, strangely perhaps, there are numbers of local unions who just despise a well-ventilated soil. Their desires are not satisfied until all free oxygen is removed, and in fact some seem to be actually injured by free oxygen.

In this connection let us see how different unions are willing and ready to cooperate. One that demands air, an aerobic group, consumes the oxygen available, and thus helps his brother craftsmen, the anaerobes, to live and labor.

Many human laborers are insistent in their demands that their food contain certain meats, vegetables, fruits or desserts. For instance, cases have been known where human workers have refused to continue their labors until food agreeable to their tastes was furnished. We have a closely similar situation with the micromen. If considerable straw is present in the soil, the farmer hopes to see it decomposed and expects the bacteria and other soil organisms to carry out its decomposition.

A number of guilds of these tiny craftsmen are able to attack cellulose. Some aerobic rods, certain anaerobic species and at least one Spirochaete work readily and in the case of the latter organism solely on cellulose. However, these organisms will do this job only provided their working conditions are met. They simply demand a source of nitrogen in their food. It is true they may not be insistent on T-bone steaks, as their human counterparts, but have nitrogenous substances they will, or they promptly go on strike.

A friend was in the habit of feeding some micromen a diet of shredded filter paper and certain mineral salts, including nitrogenous salts. These little workers rapidly destroyed the filter paper added to the pots in which the soil was kept and became exceedingly numerous. However, when an additional amount of filter paper was added, if the nitrogen supply was forgotten, the little fellows promptly quit working. How could you expect them to work when they could not build their bodies out of the food that was

furnished, since to make protoplasm, nitrogen was necessary as well as the elements carbon, hydrogen and oxygen present in the filter paper.

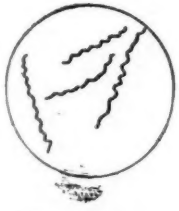
Interestingly enough, the cellulose, in this case filter paper, even if additional nitrogen was not added would slowly but very slowly disappear. You suppose that some of these cellulose attacking microworkers decided to break their contracts? Decidedly not, but as some of their brethren died, they were able to digest the dead bodies of their brother workers with the help of other bacteria of decay, and thus carry on slowly. Let us not consider these micromen cannibals, for they do not kill their brothers for food, but if some of the craft have died from other causes, then the case is different.

Let us now consider briefly the activities of some of the highly skilled or more special guilds of this great fraternity in the soil. We do not expect carpenters to begin the superstructure on a house until the masons have completed the foundation. Neither must we expect a group of workers like the nitrifying bacteria to begin their work until their friends, the bacteria of decay, have brought their work to completion and changed the nitrogen originally present in organic combination to ammonia.

We have two separate unions of the nitrifying bacteria. One group must have ammonium salts which they oxidize to nitrites and in this way obtain the energy needed to build their bodies from carbon dioxide and mineral salts. They will consume no organic food whatever. Just as soon as these nitrite formers have changed the ammonia to nitrites, the nitrate formers jump in on the job and convert the nitrites to nitrates.

Now the farmer is getting results, for the ammonium salts in the soil and the nitrates are taken up by his crop plants, and these crops grow. What has the farmer done, and just how has he let the contract to the micromen? He has stirred the soil and increased the ventilation, giving his bacteria the oxygen so many of them demand; he has furnished food and minerals which all of them need. If the soil had too many free hydrogen-ions (too much acidity) he may have tied up a lot of them so they could do no more mischief, by the addition of lime. All in all, while the farmer probably does not know it, he is satisfying the demands of the labor unions to which these micro-workers belong.

Another of the special guilds of micro-workers has specialized in a different direction. This group has learned of a better way to get along than any of its fellows. The free-living nitrogen fixers, called by their human admirers Azotobacter and Clostridium, do not have to depend on the organic or inorganic material of the soil for their nitrogen. If protein or peptone is handy, they will eat it of course, but they do not require it. In fact this special group of micromen show evidence of advanced



ability, ability not possessed by not only their fellow craftsmen of the soil, but not possessed by the higher plants or animals, even man.

Although the air we breathe is about four-fifths nitrogen we can not use this nitrogen, neither can the green plants. In the nitrogen-fixing bacteria we have a few groups of micromen who know how to get their nitrogen from this inexhaustible source. We might suppose that these microworkers, having learned how to get their nitrogen from the air, would be able to grow without organic food, but not so. They are still dependent on sugars or substances closely akin to sugars for their energy requirements and disdain to touch celluloses and lignins.

Azotobacter happens to be an aerobe, while Clostridium is an anaerobe. Hence it happens that not infrequently these two groups are found growing in partnership, the Azotobacter developing until the oxygen is used up, and then the process of nitrogen fixation being continued by the anaerobe, Clostridium.

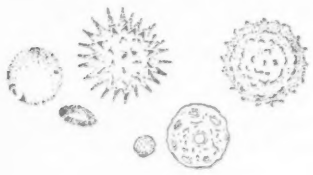
The Azotobacter cells usually quit when the hydrogen-ion concentration reaches an acidity referred to as pH 6.0 and refuse to grow under more acid conditions. Just at present experimental work is under way to try to learn just what grievance the micromen have. Are they disturbed by the hydrogen-ions present or do they object for some other reason, since we know that occasionally they do work under more acid conditions?

It may be that the farmer decides to plant a leguminous crop to help enrich his soil. This attempt will avail him nothing unless certain humble nitrogen-fixing bacteria are present and working in his soil. To be sure he has the right ones available he may import labor to his liking, by inoculating his seed.

The nitrogen-fixers that live on legume roots in the soil, like their other associates of the soil, belong to a number, perhaps a dozen or more of different unions.

One will grow only on soybeans, for instance, another will attack vetches and garden peas, another will grow on alfalfa and sweet clover and so on.

These nitrogen-fixers attack the roots of the leguminous plant and the plant responds by growing a nodule in which the micromen live and labor. We may consider these bacteria as parasitic on the roots because they demand and get organic food



from the legume plant. However, the legume is able to fight back and take from the micromen a good deal of combined nitrogen, so the parasitized legume plant is really the gainer after all.

Another highly specialized group of microworkers include the so-called sulfur bacteria. Some of these oxidize hydrogen sulfide formed by the bacteria of decay to sulfur and some change sulfur to sulfuric acid. In a few cases the farmer has been instructed to import sulfur bacteria, but this is largely unnecessary as enough of them are usually already there waiting for a chance to do their share. Now what do you suppose becomes of the sulfuric acid? Of course, if any happens to come in contact with a piece of filter paper or a similar piece of organic substance, it may have the same effect as when sulfuric acid is accidentally spilled on your suit. You know it just simply ruins good clothes to have sulfuric acid drop on them; they never look the same afterwards. In the soil there are bases available, and as soon as the sulfuric acid is formed, it unites with them, forming sulfates which may be taken up by the plants.

Without these micromen of the soil, together with the fungi, Actinomyces, etc., which we have not space to include in this paper, dead matter in the soil would never decay, elements would remain tied up for many years, and the world would be in a bad way indeed. For this reason we are in absolute need of the valuable services rendered by these largely unseen and unsung heroes of the soil.

Let us not conclude this paper without a brief mention of the gangsters or racketeers among the micromen, for here we have another counterpart of a phase of modern anti-social activities among these lowly microbes. In all soil there are lurking sinister forces which may cause considerable damage if certain gangs of the racketeering micromen can just get a chance to work. We refer to a group of bacteria known as denitrifiers. They attack the nitrates of the soil and destroy them, giving off nitrogen in the form of a gas and it is then lost from the soil.

Another thing about these marauders is that they sometimes cooperate with other ordinarily respectable micromen in carrying out their mischief. For instance, *Bacillus coli* may break down nitrates to nitrites and along comes *B. denitrificans* and turns the nitrites into free nitrogen and then it is lost.

How can the farmer protect himself against this band of outlaws? He can see to it that the conditions in the soil are such that these destroyers can not work. Good aeration is one of the easiest ways of preventing their action and this may be obtained by cultivation and drainage, and (Editor's Note) by putting composts in the soil.

## *Announcement To Farmers*

WE have interested the Great Valley Mills of Paoli, Pa. (near Phoenixville) to encourage farmers to grow crops organically. This historic mill was established in 1710 and has a beautiful setup of water-powered French Buhr millstones. It grinds grains slowly and coolly, therefore retaining all the natural vital elements in the finished products.

This mill will pay farmers a substantial premium, over and above the current price on wheat, corn, rye, buckwheat as well as on barley and oats if hulled, provided it is grown organically. These crops will then be available to readers of Organic Gardening. Our aim is to gradually interest farmers generally to grow an entire range of crops and fruit without strong chemical fertilizers so that our readers and the public will be able to have the benefit of a more healthful diet.

If you are a farmer or merely interested in purchasing these products write to:

The Great Valley Mills,
Paoli, Pa.

# *Hints For The Victory Gardener*

**This is the twenty-third of a series of articles by this author dealing with the cultivation of ordinary vegetables.**

BY ROGER W. SMITH

## PARSLEY

EVEN though your Victory garden is very small you will still have room to grow a few parsley plants. If you have no garden, pots or window boxes offer sufficient space. Today, parsley is generally used to decorate chops and steaks without thought for the plant's real dietary value. This custom of using parsley as a decoration has an interesting history.

In ancient days prize cattle were decorated with parsley wreaths to show their worth much as we use blue ribbons. Later, victorious warriors and gladiators were crowned formally with parsley. Many of these sturdy men consumed their decorations in the belief that doing this brought them strength and made their sight keener. Modern science confirms their belief by showing that parsley is especially rich in the Vitamins A and C and contains much iron. Naturally, you will want to grow this healthful plant.

Parsley is a small biennial herb with finely divided aromatic leaves. "Curled Dwarf" (70 days to maturity) has moss-like bright green leaves and is a great favorite. Twelve or fourteen of the compact little plants will provide enough foliage for the average family.

In early spring, after a goodly amount of compost humus or well rotted manure has been dug into well pulverized soil, parsley seed may be sown in rows twelve to *eighteen inches apart*. The seed should be covered with one-half inch of finely sifted mature compost humus. The seedlings should eventually stand six to eight inches apart in the row.

Parsley is hardy to cold. It suffers much from heat. Dryness during its early stages is often fatal. Germination during drought is often very poor. Therefore, the plants will require your close attention especially when they are very young.

While you are preparing the ground in which the plants are to grow, it is a good plan to allow the small seeds to soak in compost water to aid germination. They may then be mixed with a quantity of clean sand and this mixture spread thinly along the drills. After sowing the seed and watering well, the rows may be covered with planks or similar material to prevent too rapid drying out; but just as soon as the seedlings appear this covering should be removed. If the weather is unusually dry, the planks may be propped up on edge along the rows to provide partial shade.

After the plants have started it is most important to keep them growing strongly. The organic humus which has been incorporated in the soil will do much to make easily available a steady supply of moisture and natural plant nutrients. A side dressing of humus during the growing season will supply additional nitrogen, conserve moisture, and ensure steady, healthy growth.

Parsley, being a biennial, survives the first winter and provides a second crop of leaves the following year when the plant flowers and produces its seed. If you save some of this seed, the plants it produces will probably be lacking the "curled-moss" type of foliage. Most of them will be rather smooth-leafed and upstanding. This fact should not discourage you. Many people prefer the smooth-leafed types. These plants are quite as high in food value and flavor as the more ornamental types from which they sprang. And if you are surprised by slight differences in the plants which grew from the seed you saved, you might bear in mind that the Greeks confused celery and parsley because at that time they were very similar.

Besides leaf-type parsley you might like to try the rooted type. The culture of "parsnip-rooted" parsley is about the same as that for leaf parsley. The roots of the parsnip-rooted types are usually dug late in the fall. The Victory gardener's wife will appreciate the fine flavor these roots add to her soups and stews.

And when the snow melts on your garden after a long winter, the little row of parsley you planted the previous year will likely be the first living thing to greet you; hopefully green and bright it will stir you into making plans for the coming Spring.

# *Chemical vs. Organic Fertilization*

**A series of articles by the famous leader of The School of Living, Suffern, N. Y.**

**BY RALPH BORSODI**

**Part 6**

THE quantity of plant nutrients extracted from land by crops varies in accordance with the crop and the yield. Wheat extracts more nitrogen and phosphorous from the soil than does corn. A 60-bushel yield of corn extracts twice as much plant-food as a 30-bushel yield grown on the same area. Table 3 contains in its first column the quantity of the most important plant nutrients removed from an acre of land by typical yields of the various crops in the 5-year crop rotation used as a basis of study in this Bulletin. Although plants extract many more substances from the soil than those listed in Table 3, the plant-foods to which most importance has been attached are the three chemicals symbolized by N, P and K, (nitrogen, phosphorous and potassium), and the two supplied principally by limestone—calcium and magnesium. The necessity of restoring to the soil these constituents has been emphasized by agricultural authorities for many years. Recently, however, the fact that many other elements, of which only minute quantities are needed by the plants, may also have to be restored to the soil to maintain its productivity, has begun to be recognized. Only a few authorities have as yet, however, come to recognize that the maintenance of fertility, (as well as the preservation of soil, plant and live-stock health), requires the return to the soil of *every* element extracted by the crops raised.

Table 3 compares the approximate amounts of plant nutrients *removed* from the soil in the 5-year rotation we have been studying, with the amounts *returned* with two entirely different plans for fertilization—one based upon the use of commercial and chemical fertilizers, and the other based upon the use of the Indore Process. The yields assumed for each of the five crops are representative results obtained by farmers in the East and are neither the largest nor the smallest which might have been used. Assuming that a farmer raises 30 bushels of corn, 45 bushels of oats, 30 bushels of wheat, 2 tons of clover and 1½ tons of hay in the five years, he extracts from each acre of land about 245.5 pounds of nitrogen, 95.7 pounds of phosphoric acid, 245.5 pounds of potash, and lesser quantities of the other nutrients as shown in the first column of the table. (1) A small part of these nutrients are returned to the soil by purely natural processes from the sub-soil, from the air, and from rains. If, however, none of them were ever replaced by the farmer, the yield would gradually drop to a level so low as to make cultivation not worth while. (2) Fertilization is simply the work of replacing these nutrients so as to maintain and, if possible, increase productivity. Two representative eastern agricultural institutions were asked by the Research Division of the School of Living for fertilization recommendations to be used on land from which these crops were to be grown in a five-year rotation. The New Jersey Agricultural Experiment Station recommended 10 tons of stable manure, 1 ton of limestone, and 250 pounds of 20 per cent superphosphate for the corn; 200 pounds of superphosphate for the oats; 300 pounds of 3-12-6 mixed fertilizer for the wheat;

(1) The detailed calculations by which these quantities were arrived at will be found in Footnote 1 of Table 3.

(2) Tests extending over long periods of time have shown that land will produce a certain minimum crop of cereals, for instance, year after year without the addition of any kind of fertilizers other than those which are incidentally returned to the soil from the mere cultivation of the crop. On the famous experimental Plot No. 3 at Rothampstead, England, the yield has been more or less constant since 1862 at about 12 bushels per acre. Wheat has been grown on this plot every year since 1844 and no manure or fertilizers of any kind added since that date. The nutrients required to produce this yield were provided entirely by natural processes in the growth itself and the decay of the root system, stubble and weeds turned in after harvest.

four tons of stable manure for the clover or mixed clover and timothy, and 250 pounds of sulphate of ammonia on the second hay crop. (3) The quantity of the principal plant nutrients replaced by carrying out this recommendation is shown in the second column of Table 3. It will be seen that all the recommended fertilizer materials put together replaced only 201.5 pounds of nitrogen against 292 pounds extracted, and only 158.7 pounds of potash against 245.5 pounds extracted. On the other hand, the recommendations supplied more than twice the quantity of phosphoric acid extracted; over six times the quantity of calcium and sulphur extracted, and over seven times the quantity of magnesium extracted. Yet this recommendation comes much nearer to balancing the nutrients extracted than does the simpler and less expensive recommendation of the New York State College of Agriculture which called for 10 tons of stable manure and 400 pounds of 20 per cent superphosphates for the corn; no fertilizer for the oats, and 1 ton of limestone and 400 pounds of superphosphate or 5-20-5 mixed together, for the wheat crop. (4).

In Table 1, the cost of fertilizing the land on the plan recommended by the New Jersey Agricultural Experiment Station was shown to be about $64.39. In the second column of Table 3, the quantity of the various nutrients supplied to the land for this amount of money is shown. (5) The nutrients returned to the soil with a program based upon the use of the Indore Process, *at a cost of only* $43.92, will be found in the third column of Table 3. The fertilization recommendations which supplies these nutrients were made by Sir Albert Howard, (6) developer of the Indore Process. His recommendations for this five-year rotation call for 20 tons of composted humus, in two applications, and one-half ton of limestone. This plan of fertilization not only costs about one-third less than the method based upon using chemical fertilizers but also supplies nearly twice as much NPK—nitrogen, phosphorous and potash—not taking into account the fact that it supplies these three important chemicals in organic forms in the humus as compared with the inorganic, mineral form in which they are supplied by the plan of commercial fertilization. As a matter of fact, it supplies nearly twice as much organic material as a whole than does the chemical fertilization plan. On the face of the record, the School is justified in asking why any farmer should pay over 30 per cent more money to put about half as much organic material, a third less nitrogen, 40 per cent less potash, and less than half as much phosphoric acid into his soil? It is true that the plan of commercial fertilization supplies more lime and sulphur, but since organic fertilization furnishes over twice the amount of sulphur, over four times as much calcium, and over six times as much magnesium as is removed, the surplus of lime and sulphur in the plan of commercial fertilization may be entirely disregarded. From the scientific standpoint, the overwhelming superiority of the organic process lies not only in the greater organic content and the larger supply of NPK but also in the fact that the mixture of manure and plant compost recommended contains quantities of *every single element needed for plant growth in the proportions actually needed by the soil.*

Organic methods of fertilization were extensively practiced in this country before the promotion of chemical fertilization began. The Bommer method, which is described in a pamphlet still available, was one of them. (7) Remarkable results are being obtained from organic fertilization on farms in the United States studied by the School which use the Bio-Dynamic method of organic fertilization. (8) The In-

(3) The detailed analysis of the plant nutrients contained in these fertilizing materials will be found in Footnote 5 of Table 3. It is worth remarking that so far as the School has been able to determine, no plans for fertilization throughout a full crop rotation have ever been made or published; recommendations by the fertilizer industry and agricultural authorities are usually made for only a single crop, which makes no allowance for carry-over and must therefore involve very extravagent usage of the chemicals.

(4) The detailed analysis of the nutrients in this recommendation will be found in Footnote 5 of Table 3.

(5) When the total amount of nitrogen and potash supplied by this commercial fertilizer plan is compared with the total amount removed by the crops, it will be seen, as has already been mentioned, that the amounts of nitrogen and potash supplied is less than that removed, whereas phosphoric acid, calcium, magnesium and sulphur are supplied in greater amounts than those removed. Nitrogen is restored to the soil by clover or other leguminous crops, and when proper rotation is practiced this nutrient is adequately obtained without chemical supplement. Phosphoric acid is usually recommended in larger quantities because the soil has a fixing power on this compound and only a very small portion is available to plants at any one time. Several compounds such as calcium and magnesium are recommended in very large quantities in order to allow for leaching and drainage, and therefore the amounts furnished in most commercial fertilization plans is greatly in excess of that actually extracted by the crops themselves. The loss of nutrients through drainage and erosion is so great that many authorities consider the amount of nutrients removed by crops a poor indication of soil needs. The fact that our present terrible losses of soil nutrients through drainage and erosion may have had their origin in the failure to replace humus through chemical fertilization, is ignored. The way to deal with this situation is not to supply excessive quantities of chemicals to be drained away, but to replace humus.

(6) Sir Albert Howard, C.I.E., M.A., formerly director of the Institute of Plant Industry, in Indore, India, and Agricultural Adviser to States in Central India and Rajputana.

(7) "Bio-Dynamic Farming and Gardening," by Ehrenfried Pheiffer, Anthroposophic Press, New York City.

dore Process as developed in India by Sir Albert Howard has proven itself on numerous small and large farms in England and Africa as well as in Asia. By composting all animal and plant wastes, the nutrients removed by cropping are returned in the quantity and form that is best utilized by the plants. While the analysis of humus manufactured from wastes gathered on farms in this country might differ from material composted of tea, hops and garbage collected on the farms for which the School has records, it is not believed that they will be substantially different. The humus made on tea plantations for which we have reports was the result of composting tea and other plant matter with urine saturated earth, soiled stable bedding, and fresh cow dung. These materials were decomposed and ready to be returned to the soil in four months. Managers of these tea estates consider that the quality of tea improved since the Indore Process was introduced. The humus made from what is called "dustbin refuse" in England on which the School also has reports, was composed of garbage and sewage wastes from the city of Manchester, in a controlled experiment undertaken to establish relative value of composting garbage collected in the city as compared with incineration. The results proved that the conversion of garbage into humus for agricultural use both safe and practical. Analysis indicated that the humus produced contained large quantities of nitrogen, phosphoric acid and potash. The reports of the analysis of humus from hop plantations, indicate that hops must contain an exceedingly high amount of prosphorous and potassium, or that hop wastes combined with town refuse and other plant and animal wastes produces humus unusually high in phosphoric acid and potash. This humus was produced at a large hop garden in Sussex, England, where 10,000 tons of finished humus are manufactured yearly.

This table is a comparison of the quantity of the principal soil nutrients supplied per acre by the method of organic fertilization recommended by the Research Division of the School of Living, and the soil nutrients supplied by the use of methods recommended when using commercial fertilizers. The soil nutrients *returned* by the two methods to each acre of land is also compared with the soil nutrients *removed* from each acre in 5 years with crops composed of 30 bushels of corn, 45 bushels of oats, 30 bushels of wheat, 2 tons of clover, and 1½ tons of meadow hay. The table makes it clear that organic fertilization not only costs about one-third less, but supplies nearly twice as much NPK. Why pay over 30% more to put about half as much organic material, a third less nitrogen, nearly 40% less potash, and less than half as much phosphoric acid into the soil? It is true that the program of commercial fertilization used in this table supplies more lime and sulphur, but since organic fertilization furnishes over twice the amount of sulphur trioxide, over 4 times as much calcium oxide, and over 6 times as much magnesium oxide as is removed in the 5-year crop rotation, the surplus of lime and sulphur (which cost very little) may be entirely disregarded. From the chemical standpoint, the overwhelming superiority of the organic process lies not only in the greater organic content and the larger supply of NPK but also in the fact that the mixture of manure and plant compost recommended contains quantities of every single element needed for plant growth in the proportions actually needed by the soil.

TABLE 3

| | Soil Nutrients Removed in a 5-year Crop Rotation (1) | Soil Nutrients Returned with Chemical Fertilization (5) | Soil Nutrients Returned with Organic Fertilization (10) |
|---|---|---|---|
| | (lbs.) | (lbs.) | (lbs.) |
| Nitrogen | 292.0 | 201.5 | 299.0 |
| Phosphoric Acid | 95.7 | 197.7 | 413.4 |
| Potash | 245.5 | 158.7 | 242.0 |
| Calcium Oxide | 143.0 | 850.0 | 671.6 |
| Magnesium Oxide | 57.5 | 475.6 | 368.4 |
| Sulphur Trioxide | 74.1 | 452.0 | 162.2 |
| Organic Substances | | 6,020.0 | 11,000.0 |
| Cost (including Labor @ 30c an hr.) | | $64.39 | $43.92 |

(1) The quantity of soil nutrients removed is based upon the following study of crop production with representative Eastern yields and is not necessarily the result of the fertilizer recommendations analyzed in this Bulletin. The soil nutrients removed in the 5-year rotation here assumed are not therefore strictly comparable to those contained in the analysis of the recommended fertilizers:

| | Yield (2) | N (3) lbs. | P (3) lbs. | K (3) lbs. | C. O. (3) lbs. | M. O. (4) lbs. | S. TO. (3) lbs. |
|---|---|---|---|---|---|---|---|
| Corn—Grain, Cob & Stover | 30 Bu. | 43.0 | 18.0 | 36.3 | 7.6(4) | 10.2 | 12.0 |
| Oats—Grain and Straw | 45 Bu. | 52.0 | 19.4 | 46.1 | 11.6 | 7.4 | 19.7 |
| Wheat—Grain and Straw | 30 Bu. | 50.0 | 21.1 | 28.8 | 9.2 | 9.8 | 15.7 |
| Clover | 2 Tons | 98.0 | 24.9 | 83.4 | 90.1 | 23.2 | 15.4 |
| Meadow Hay | 1½ Tons | 49.0 | 12.3 | 50.9 | 32.1 | 6.9 | 11.3 |
| Total pounds per acre | | 292.0 | 95.7 | 245.5 | 143.0 | 57.5 | 74.1 |

(2) Representative acre yields according to Lyon and Buckman in "The Nature and Properties of Soils," p. 245.

(3) Based on data compiled by Warington, Hart and Peterson and published in "The Nature and Properties of Soils," p. 215.

(4) Based on percentages compiled by The Potash Institute, Washington, D. C, from a large number of published data.

(5) Based on recommendations in Circular 398 and specific directions given to the Research Division of the School of Living in a letter from N. J. Agr. Exp. Station Oct. 29, 1940, for fertilizing the 5-year crop rotation described in Note 1, above. The soil nutrients supplied in these fertilizers are as follows:

| | Organic Substance | N lbs. | P lbs. | K lbs. | C. O. lbs. | M. O. lbs. | S. TO. lbs. |
|---|---|---|---|---|---|---|---|
| 14 Tons Stable Manure (6) | 6,020.0 | 140.0 | 70.0 | 140.0 | 77.0(7) | 42.0(7) | 139.8(7) |
| 450 lbs. Superphosphate | | | 90.0 | | 101.3(7) | (8) | 112.4(7) |
| 300 lbs. 3-12-6 Fertilizer (9) | | 9.0 | 37.7 | 18.7 | 52.5(7) | (8) | 74.9(7) |
| 250 lbs. Sulphate Ammonia (9) | | 52.5 | | | | | 124.9(7) |
| 1 Ton Agr. Limestone (9) | | | | | 619.2 | 433.6 | |
| Total pounds per acre | 6,020.0 | 201.5 | 197.7 | 158.7 | 850.0 | 475.6 | 452.0 |

The less expensive program of fertilization based upon recommendations of N. Y. State College of Agr., (the total costs of which including labor amount to $51.26 for the same crop rotation described in Note 1 above), has also been analyzed by the Research Division of the School of Living. (The recommendations were mainly based upon Cornell Ext. Bul. 281, "Fertilizer Recommendations for New York.") The soil nutrients supplied by this program are as follows:

| | Organic Substance | N lbs. | P lbs. | K lbs. | C. O. lbs. | M. O. lbs. | S. TO. lbs. |
|---|---|---|---|---|---|---|---|
| 10 Tons Stable Manure (6) | 4,300.0 | 100.0 | 50.0 | 100.0 | 55.0(7) | 30.0(7) | 99.9(7) |
| 400 lbs. 20% Superphosphate | | | 80.0 | | 90.0(7) | (8) | 99.9(7) |
| 400 lbs. 5-20-5 Fertilizer (9) | | 20.0 | 80.0 | 20.0 | 50.0(7) | (8) | 99.9(7) |
| 1 Ton Agr. Limestone (9) | | | | | 619.2 | 433.6 | |
| Total pounds per acre | 4,300.0 | 120.0 | 210.0 | 120.0 | 814.2 | 463.6 | 299.7 |

(6) The figures generally used for mixed barnyard manure are 0.5% nitrogen, 0.25% $P_2O_5$, and 0.5% $K_2O$, according to the U. S. Dept. of Agr. Yearbook, 1938. The organic substance averages 20% to 23%.

(7) The percentages used in estimating the quantity of calcium, magnesium and sulphur were furnished by New York State College of Agriculture as "very general figures" since the amounts of these ingredients vary considerably in both fertilizer materials and mixed fertilizers.

(8) It is not possible to approximate the magnesium content of chemical fertilizers.

(9) Based on analyses in "Commercial Fertilizers," Conn. Agr. Exp. Station Bulletin 404.

(10) The soil nutrients which the Research Division of the School of Living estimates in the program of fertilization by the Indore process described in Table 1, is based upon averaging the constituents as reported in five studies:

| | Organic Substance | N lbs. | d lbs. | K sqq | C. O. lbs. | M. O. lbs. | S. TO. lbs. |
|---|---|---|---|---|---|---|---|
| 20 Tons Tea Plantation Waste (11) | | 180.0 | 80.0 | 200.0 | | | |
| 20 Tons "Dustbin" Waste (garbage, etc.) (12) | | 320.0 | 200.0 | 120.0 | | | |
| 20 Tons Hop Plantation Waste (13) | | 384.0 | 860.0 | 248.0 | | | |
| 20 Tons Compost from Animal, Plant Wastes, Canal Sod, Mud (14) | 11,000.0 | 312.0 | 513.6 | 400.0 | | | |
| 8 Tons Manure (15) | | | | | 44.0(7) | 240.0(7) | 79.9(7) |
| 12 Tons Plant Wastes (15) | | | | | 318.0 | 127.6 | 82.3 |
| ½ Ton Agricultural Limestone (15) | | | | | 309.6(9) | 216.8(9) | |
| Average pounds per acre | 11,000.0 | 299.0 | 413.4 | 242.0 | 671.6 | 368.4 | 162.2 |

(11) The average percentage composition of 60 samples of animal and plant material composted on a tea estate in Travancore, South India, was nitrogen 0.45%, phosphoric acid 0.2%, and potash 0.5%. From a copy of a lecture by Sir Albert Howard published in the "Journal of the Royal Society of Art," Nov. 22, 1935.

(12) Based on the average N P K contents of compost produced from city garbage and dustbin refuse at Wythenshaw, England. From "An Agricultural Testament," by Sir Albert Howard, p. 111.

(13) Based on the N P K contents of 10,000 tons of compost produced from city refuse, and plant and animal wastes collected on a large hop garden at Bodiam, Sussex, England. From "An Agricultural Testament," p. 107.

(14) Based on analyses of compost made from the wastes of livestock, herbage and straw, with soil, sod or mud from ditches and canals at the Nara Experiment Station, in Japan. From "Farmers of Forty Centuries," by F. H. King, p. 186.

(15) In a letter to the Research Division of the School of Living dated Oct. 12, 1940, Sir Albert Howard, under whose direction the Indore process was developed, recommended that 20 tons of compost be used for the crop-rotation described in Footnote 1 above. This 20 tons was to be composed of 8 tons of manure and 12 tons of plant waste. In order to include some estimate of calcium, magnesium and sulphur contents of the program recommended by the School, the quantity of these nutrients in the manure component was estimated as the same as that described in Note 7 above, while the quantity of these nutrients in the vegetable waste component was based upon the average of two samples of compost made at the School of Living in 1940 and analyzed for it. These two samples contained 1.3½% calcium oxide. The magnesium and sulphur component was assumed to be about the same in proportion as in the case of manure. Sir Albert Howard also recommended the use of ½ ton of agricultural limestone for the fertilization program for the 5-year crop rotation.

## *The Compost Idea Is Spreading*

**From The Radio Times (England) August 18th, 1944.**

In his recent article, 'A Full Harvest . . .' C. Henry Warren unwittingly drew attention to many grave errors being made in the name of scientific farming. The subject is one so vital—soil, plant, and animal life and health being inter-dependent— that it should be pursued. Science can help agriculture only in so far as it is working in harmony with natural law, and contrary to Mr. Warren's sincere belief that science and mechanisation have been so progressive as to merit the assistance of Providence to further their good work. We shall ultimately pay the price of the modern methods of impoverishing and maltreating the soil.

This fact is to-day disturbing many eminent experts, who know full well that the land bears no curse but the ignorance of man. Fertility and abundance lie in treating the land as a sacred trust by getting a real understanding of the Rule of Return (the answer to which is composting). Then we can leave the elements, with which it is difficult to monkey anyway, to the care of the Almighty.

WINIFRED PENNY.

Disley, Nr. Stockport, Cheshire.

# *Is Basic Slag Really Necessary?*

By SIR ALBERT HOWARD, C.I.E.,

Fellow of the Imperial College of Science

IN the last number of the *News Letter on Compost* (No. 8 Feb. 1944. p. 4) the question whether basic slag is really necessary in this country was discussed in some detail. The tentative conclusion was reached that the money spent on this manure is largely wasted and that results at least as good can be obtained, but at far less cost, by sub-soiling 18 inches or so deep and 4 feet apart.

Confirmatory evidence for the suggestion that basic slag and sub-soiling produce very similar results and that on sub-soiled land basic slag will produce little or no effect is already beginning to come in. Mr. Delgado of Little Oreham, Henfield, Sussex, in a letter dated April 3rd, 1944 writes:—

"In April 1943 I sub-soiled a four acre meadow which was literally soused with a century or more of organic decay for about four inches under the turf. I should imagine it was very acid since it hardly grew any hay and the stock loathed it. It was, in fact, one of those meadows which give spectacular results with a heavy dressing of slag. In the previous autumn stock had been shut up in it and fed with green stuff carted from another field.

Soon after sub-soiling the meadow was ploughed and one third of it dressed with 10 cwt. of slag to the acre. It was sown with oats and tares. *The crop was uniform throughout the field.* In autumn of 1943 the field was ploughed again. *The ploughman, who did not know I had slagged a portion of the field, noticed the land was harder on the slagged area.* Winter oats were drilled and at the time of writing (April 3rd, 1944) the crop is uniform.

The oats are going to be undersown with a grass mixture and it will be interesting to see if there is any difference in the take of the seeds as phosphates are supposed to be essential when laying down to grass."

In a subsequent letter, dated April 22nd, 1944, Mr. Delgado reported that as the oats were very forward he had been compelled to graze them by cattle. The stock grazed the oats evenly and showed no preference whatsoever for the slagged portion. He will continue to keep this field under careful observation and report if any differences develop and also take note of the reaction of the grazing animal to the following grass crop.

Perhaps the Ministry of Agriculture will let the nation know how much has been spent on the purchase of basic slag since war broke out on Sept. 3rd, 1939; the total amount of the subsidies from public funds paid to the farmers to help them to purchase this material and also how many sub-soiling sets could have been purchased and how much land sub-soiled by means of this money. Some member of the group of statisticians on one of the staffs of our agricultural research institutes could no doubt furnish this information.

Besides the soil aeration aspect of this basic slag question there are two other factors of some importance namely the effect of phosphatic manures on the earthworm population and on the texture of the soil. Some interesting observations on these after effects of phosphatic manures on these two matters have recently been recorded by Mr. F. C. King, the Head Gardener at Levens Hall, Westmorland (*The Compost Gardener,* 1943, p. 77). Mr. King's experience has a direct bearing on this basic slag question and is given in his own words:—

"The next group of artificials embraces those that supply phosphoric acid, or the phosphatic manures. Of these the best known and most widely used are basic slag and superphosphate of lime. I have used considerable quantities of both and was quite satisfied at the time that I had done a wise thing; now I am patiently retracing my steps and building up the fertility of the soil under my charge on a surer foundation. The good effects from the use of these artificials were not maintained and the deterioration of

the land was so marked that I had no option but to discontinue their use.

The first indication of something being wrong was observed in the earthworms. Not only were they less in number, but the varieties changed; instead of the good red lob worm, the garden began to be infested with the long black-headed worm and later by worms which were nearly white. Seldom in digging over a piece of ground was it possible to see a healthy vigorous worm, by far the greater number being knotted up like a ball, incapable of performing their most vital task of burrowing deep and thereby assisting in draining and aerating the soil. All this occurred during a period when plenty of farm-yard manure was available and was being used on the land. The physical character of the soil changed rapidly owing to the souring influence of slag and superphosphate. The land had to be caught just in the right condition for working, otherwise it became knotty. Trenching and ridging were undertaken every year to try and improve the texture, yet each spring found the surface sullen and harsh. The garden was infested with slugs to such an extent that every bit of green leaf was eaten by them; 10,000 onions disappeared in less than a week, and they even climbed the Gooseberry bushes and stripped off the leaves; Potatoes at lifting time were mere shells and few were fit to store. Since discontinuing the use of these two artificials the garden is gradually returning to a workable condition, except where Potatoes have been most frequently grown and where superphosphate was used regularly. These portions are still stubborn, working badly in the spring, caking badly in the summer and producing much below their capacity.

This leads me to believe that probably the mineral superphosphate was more responsible for the bad effect on my soil than was the slag, but as I am getting much better results without either slag or superphosphate I can only conclude that they were valueless to me.

Another very significant fact came to light in the behaviour of the weed crop. Groundsel, for instance, flowered when about two inches high and the same piece of ground produced from three to four crops during summer and autumn. Daisies appeared—another sign of sour land. Amongst the vegetable crops, Cauliflowers buttoned very early, Cabbages grew hard and tough, Peas were short in growth and Lettuce leathery. On a particularly bad piece of ground, years after the land had been dressed with basic slag and superphosphate of lime for previous crops, a mile of Onions was a complete failure. The ground regularly received a full dressing of lime, which however failed to correct the acidity caused by the artificials.

I am satisfied that the death of the earthworms and soil bacteria was due to the use of these chemical manures and that they were directly responsible for the destruction of the soil texture. During the years when these artificials were being regularly used, labour was abundant and no routine of good cultivation was neglected; yet with ample labour and an adequate supply of farm-yard manure, combined with the use of artificials, the garden became sick and produced inferior crops."

These after effects of basic slag and superphosphate on the well being of the gardener's unseen labour force and on the texture of the soil are most interesting and suggest that in all cases where artificials are used careful note should in future be made of any changes in the soil itself. It is well known that repeated applications of basic slag on pastures, notable for their mushroom crops, often lead to their complete disappearance, a fact which suggests that some profound change must have taken place. *One* application will *always destroy* mushroom growth for a number of years.

Mr. King's observations also throw light on the current view so persistently advanced by the advocates of artificial manuring, that the correct policy to adopt is a combination of humus and artificials. The somewhat unnatural character of this union is obscured by advice at once misleading and comforting namely that such manuring is "balanced". But Mother Earth apparently does not agree with this salesman's patter. At any rate the earthworms and the mushrooms have registered a strong protest. There seems to be something wrong somewhere with this much advertised conception of "balanced manuring."

This matter was referred to by the Joint Parliamentary Secretary of the Ministry of Agriculture and Fisheries (The Duke of Norfolk) in the House of Lords on Oct. 26th, 1943 in the following words:—

"It is not a question of fertilizers versus dung, it is a question of using both to their best advantage and using them in proper proportion. There is no evidence whatever, from farming or medical experience or from the scientists, that the proper and balanced use of fertilizers has any harmful effect whatever on

the soil, on the health of crops or of man." (*Parliamentary Debates,* House of Lords, Vol. 129, No. 98, p. 324).

I should like to suggest with all respect that the Ministry of Agriculture, their advisers and their technical staff should all make a very careful study of the effect of balanced manuring—chemicals and farm yard manure—on the soil, the soil population, the crop and the live stock. In this investigation they would do well to join forces with the men in closest touch with the soil—our most experienced gardeners and agricultural labourers—who instinctively observe even the slightest reactions of Nature. Although I have spent a life time in these studies all over the world I never talk to one of these men without learning something useful which enlarges and deepens my experience.

On the scientific side these studies might begin with the evidence afforded by the microscopic structure of the plutonic rocks from which our soils are ultimately derived. It will be found that these primary rocks are by no means deficient in phosphate and that there is no reason why the sedimentary rocks and the soil which are derived therefrom should suffer from a shortage of this food material. There will of course be a shortage if the natural circulation of phosphate between crop and soil is impeded. Once this circulation is restored by means of sub-soiling and the use of the deep-rooting constituents of the ley on the lines advocated by the late Mr. R. H. Eliot in the *Clifton Park System of Farming* (Faber & Faber, 1943) most signs of phosphatic deficiency are likely to disappear.

It will, I think, be found that the phosphate problem in British Agriculture is a veritable mare's nest which has largely been created by the superficial character of most of what goes under the name of agricultural research and which has nowadays been made an object of veneration by administrators, research workers and the farming community alike. I fear their god will sometimes possess feet of clay.

---

# *Stacking Beans*

**New York Times (Sept. 14, 1944.)**

When the nights are crisp and frosty and the first thin silvery sheet of ice forms on the watering trough in the barnyard, comes the time to stack the beans. The splotches of yellow foliage in the clumps of gray birches along the pasture wall match the color of the dried, frost-seared rows of beans. There are several favorite varieties of beans for baking. Some prefer the rich, mellow Red Kidney; some vote only for the mealy, crunchy Yellow-Eyes; others see virtue in the small nutty Pea Beans. The farmer knows that whatever the variety, the stacking of his winter's supply of Saturday night baked beans is an important autumnal task.

First one takes a light axe and goes to the pasture or woodlot for a gray birch of just the right size. It must be from two to three inches in diameter; it must be studded with small sturdy branches. The branches are cut off about eight inches from the trunk; the base end is cleared to a height of two feet. The tree is cut off so that the total height is about seven feet. Around these trees, with their dozens of prickly, wooden quills, the beans are stacked.

After the base has been jammed into a hole made with a crowbar, a few flattish stones are placed under the branches around the small trunk. Then the stacking begins. Handful by handful, the bean stack is built. The root ends go next to the pole. Round and round the stack the farmer works, fitting the roots tightly against the pole, pushing and pressing the pods and dried leaves together. There's an art to building a good stack of beans as there is to building a load of hay. The same rule applies: keep the center lower than the outside edges. The top cap is carefully finished, rounded and compact.

Through days of mellow fall warmth and nights when the Black Frost touches field, pasture and meadow, the beans stand on the stacks, drying out for their destiny in earthen pots in steady, hot ovens. Then, before the storms of late autumn lash the land, the farmer moves them to the edge of the barn floor. Some windy December day he will pull them from the stacks, spread the plants in a layer on the barn floor and flail out the nuggets.

Harvesting the sage crop in the author's garden in North Carolina

# *Growing Herbs in the South*

**Reprinted from Horticulture Magazine**

WITH a few seeds of sweet basil, sent by a friend, I launched the most fascinating venture of my life—herb growing in the South!

Had I not been a tenacious soul I would have given up the idea of herb culture with those first few pots of ever useful sweet basil, because I met with complete discouragement on every side, but in my subconscious mind, I remembered the exquisite herb gardens in England. Then, too, I knew that our herbs came principally from Europe, whence the war had greatly curtailed our imports of leaves, roots and seeds.

In the Fall of 1940 I began studying what little information there was on the subject of herb growing and it was then that I realized what an uphill job I had undertaken, for the books which I had been lucky enough to find were written by northern authors and instructions were given for growing herbs in their particular climate; therefore, I had to make my own deductions.

I converted an old cabin into a greenhouse where I made sections or benches which held soils of poor, medium and rich content. During the experimental stages it was found that herbs thrived in well-limed medium or even poor soils. The soil which contained a large amount of sand was the herb plants' favorite ingredient. They must have a friable soil.

In the following Spring all the plants, which included hundreds of plants from cuttings in boxes of sand, were taken out-of-doors and were carefully watched. However, I soon learned that the "full sun" of which our northern friends speak, is by no means the "full sun" that we know in the South. After a tragic ending for many plants, I quickly reorganized my formal garden and provided shade for plants which I found could not withstand the scorching mid-day sun. I continued making cuttings and enlarging the herb crop by permitting seeds to fall, as seeds were getting extremely scarce.

In 1941 I planted one pound of sage seeds (Salvia officinalis) which developed into a spectacular crop of more than one acre. This was another experiment which was gloomily discouraged by farmers who had tried small crops of sage but the plants died out and the crop was not feasible. I discovered one secret in growing sage, which is the need of keeping the plant trimmed very low. Sage plants should be severely trimmed in Spring and Fall, thereby allowing a new growth in the follow-

ing Spring. If this is done the plant does not become woody.

My sage crop was divided into three sections: One area was ploughed between rows, but this treatment was too drastic and disturbed the roots, causing the loss of hundreds of plants.

The second section was not cultivated except when the weeds were dug by hand, but even here there was a high percentage of loss.

The third section was mulched with leaves and received practically no cultivation; the plants were kept low and became sturdy and bushy. In this group there was not a single loss for two years.

The value of mulching in the South cannot be over-emphasized. By this method the ground retains moisture and weeds are almost unheard of. In the Fall, after cool weather has definitely arrived, well-rotted cow manure is thrown over my beds of herbs, after which cotton seed motes are used and the leaves that fall naturally over the area are left undisturbed. It is advisable to use lime on herbs at least twice a year. No commercial fertilizer is used here.

The herb garden, bordered with thyme and spiced pinks.

Among the plants that should be protected from the sun, even to the extent of placing awnings of translucent material over them are santolina, comfrey, lavenders, hyssop, sweet marjoram, wooly betony and germander. Thymus vulgaris cannot endure too much sun unless its roots are hidden underneath rocks, or shaded in flagstone walks. Lemon thyme grows rapidly in either sun or shade, and lemon balm thrives wherever you place it. Both lemon thyme and balm are my favorite tea herbs.

Among the herbs that revel in our southern sun (unless dry weather is too severe) are rosemary, tarragon, winter savory, burnet, spiced spinks, tansy, chives, costmary, pot marjoram, chamomile and chives. Annuals, too, love the open sun. Among the annuals are sweet basil, dill, Summer savory and others. Several expert herb growers have expressed an opinion to me that oils from the above group of plants seem to be more pungent in the South than in those grown in other sections of the country.

—Cora A. Harris.
Charlotte, N. C.

# *Sunflower Seed Notes*

*Harvesting*

WHERE only a few heads are harvested there isn't much of a problem. Incidentally we advise eating some of the seeds at the beginning of the harvest season without waiting for them to thoroughly dry out. Remember that the moisture in the seed went through the plant and might be termed Nature's water. It cannot be duplicated from any sink tap. When you eat the fresh, moist seed you are getting the benefit of this fine water. For the very same reason dehydrated food products generally are not to be recommended.

A simple little device that anyone can make for getting the seed off the head consists of a piece of ½ inch square wire meshing, made rigid by putting a wooden frame around it. The size should be large enough to fit on top of a large basin type pail which is about one foot high and about three feet in diameter. The square of mesh, therefore should be about three and a half feet square.

You place the mesh over the pail, and hold the head of the sunflower in your hand with the seeds downward. Always leave a bit of the stem on the head, say three or four inches so that it will be the means of holding it firmly. Then press the sunflower head downward against the mesh and rub up and back vigorously. The seeds will fall through the wire. We cleaned off about fifteen heads in five minutes. Where the crop is large, a more mechanical means will have to be resorted to.

The main problem after cutting the sunflower head from the plant is to dry it. Some people hang the heads up to dry, others put the heads on the floor to dry; in this case the seeds should be on the upside, otherwise they will mould. Also you must see that birds do not have access to it, unless you want them to have it all. They will make away with your whole crop in no time at all. Some people thresh the seeds off the head immediately, but then care should be taken to see that they are put somewhere where they can dry out. The problem is to prevent them from moulding. If you have a tumbling barrel you might try tumbling the seeds. This might dry them out.

*Sunflower Seeds for Steers*

In harvesting the sunflower heads at our farm we decided to try and feed some to some white-face hereford steers we are fattening. We fed them the whole head but broke it up by hand into eight or nine pieces, so that each one could be handled by them at one gulp. They consumed the head and the complete seed and seemed to relish this new item in their diet. The pulp under the seeds looks very appetizing.

I fed about four entire heads per day per steer. In about three or four days their skins began to take on a very fine shine. We did not thresh the seeds off the head. A steer or a cow for that matter has a rugged digestive system. I now know for sure that steers will handle sunflower seeds easily and feel positive that it will help to turn out better meat. In the case of cows it may be necessary to grind up the seed, and it certainly would add something to the nutritional quality of the milk.

(Note). Send stamped, self-addressed envelope for free copy of our original article showing the sensational advantages obtained by persons who have eaten sunflower seeds.

# *The Regulation of the Compost Heap*

BY SIR ALBERT HOWARD, C. I. E.

THE discovery of the virtues of penicillin in regulating infection and the fact that the parent mould, *Penicillium notatum,* has been recorded in the compost heap suggest that the role of fungi in controlling the fermentation, which precedes humus formation, should be thoroughly investigated.

As is well known, Nature on the floor of the forest is the supreme compost-maker. Here an intimate mixture of vegetable and animal wastes—including a supply of lignified cellulose in the shape of bark and wood—are fermented by means of fungi and bacteria, the dead remains of these living agents amalgamating with the undecomposed residues to form leaf mould—one of the forms of humus. Fungi invariably begin the fermentation

These fungi are not the same species everywhere and often include members of the toadstool and mushroom group—the Basidiomycetes. In this natural formation of humus there are no flies, no smell, and no nuisance of any kind. The processes are aerobic (with air) throughout until the ripening phase is reached and a definite humus layer is formed. Then they tend to become anaerobic. (Lacking air). Something is preventing the putrefactive changes.

The fermentation in every successful compost heap closely follows what happens in the woods. A number of different fungi are involved in the first stages of the fermentation according to circumstances. Often the compost heaps are covered with toadstools, sometimes by members of the other groups. What is important is to start the heap with a copious development of fungous mycelium. This breaks down the vegetable wastes and prepares the ground for the bacteria, which continue the process. I have always noticed that heaps which begin with plenty of mycelium invariably end well. Heaps or pits, which go wrong, are always those in which this fungous development is absent. Then we must be prepared for trouble—flies, smell, and the putrefactive processes.

Is not the explanation of all this the capacity of the fungi of decay to regulate the fermentation? It would seem so. In that case, the discovery of penicillin is nothing more than a glimpse of the alchemy of Nature and the way she regulates her kingdom. Substances of the nature of penicillin will probably be found all through the great groups of fungi.

Another question naturally arises: If bodies of the nature of penicillin are produced in compost heaps and in fertile soil, what happens to them afterwards? Are some of these substances or their digestion products absorbed by the roots which exhibit the mycorrhizal association? If so, do they influence the synthesis of protein in the green leaf? In plants, which do not exhibit the mycorrhizal association, can the penicillin-like bodies or their digestion products be absorbed by the root hairs direct?

A vast field of investigation is opened up by this chance discovery of penicillin. It would be so unlike the operations of Nature to find that this valuable substance is the only regulator of infection.

# Reader's Correspondence

**Please write on one side only. Do not make your letters too long. Put each different query on a separate sheet. Send stamped, self-addressed envelope for reply.**

*APPLE POMACE*

Dear Mr. Rodale:

Can apple pomace be used fresh as it comes from the mill this fall, to be put around fruit trees?

Mrs. John E. Bissonette,
Birmingham, Mich.

**"SOILUTION EARTHWORMS"**
THE AUTOMATIC GARDENER
OHIO EARTHWORM FARMS
THE WARNER'S
WORTHINGTON, OHIO.

DOMESTICATED EARTHWORMS. A complete production manual "EARTHWORMS: Their Intensive Propagation and Use in Biological Soil Building," prepaid for $1.00, with 30 day return privilege. A valuable bulletin on earthworm culture free on request.
THOS. J. BARRETT,
Earthmaster Farms, Box C-10,
Roscoe, Calif.

PHOSPHATE ROCK
We still have some finely ground raw phosphate rock left. Every vegetable gardener should use some.
ORGANIC GARDENING,
Emmaus, Pa.

For Newest Nutritional Knowledge
Read
"NUTRITION & HEALTH"
Devoted to New Discoveries in Nutrition
Edited by
Walter Siegmeister, A.B., M.A., Ph.D.
For many years Dr. Siegmeister has been claiming that correct human nutrition is only possible on the basis of correct plant feeding and natural soil fertilization without use of chemicals.
$1.00 per year. Free sample if available.
SCHOOL OF BIOSOPHY, Lorida, Florida.

Subscribe To
ORGANIC GARDENING
Organic Gardening
Emmaus, Pa.
Gentlemen:
Enclosed is $2.00 for one year subscription (12 issues) to Organic Gardening.
NAME .....
.....
ADDRESS .....
.....

**BULB UNUSUALITIES**

Plant them now. Ixiolirion, Lewisia, Alstroemeria, Veltheimia and the hundred other bulb-delights in that new Fall Catalog of ours that you should ask for today.

REX. D. PEARCE
Dept. D.
Moorestown, N. J.

The GRAVELY
GARDEN TRACTOR & POWER MOWER
Three machines in one.
Ideal for the Estate Owner.
Cultivates your garden . . cuts tallest weeds . . mows your lawn
GRAVELY MFG. CO. Box 150 Dunbar, W. Va.
WRITE FOR CATALOG

- Cuts Down Watering
- Saves Cultivation
- Reduces Weeding
- Improves Root Development

Ask your dealer, or
Redwood Fibre Prod. Co.,
Dept. O.,
Santa Cruz, Calif.

*Answer*

Dear Madam:

The one difficulty about using apple pomace is that it is usually from trees that have been heavily sprayed with poisons. If you are sure that no poisons have been used, the next best thing would be to make compost out of it. In doing this you will find apple pomace to be very stubborn in the compost heap. We once used this material from a cider mill and it did not seem to decay in the compost heap. This, no doubt, was due to the fact that it was sprayed. The poison on the apple skins acts as a retardent to decay. Possibly unsprayed pomace might decay faster. One of our readers sometime ago wrote that his apple pomace decayed readily. In nature, of course, the apples that fall under the tree gradually decay and possibly eventually help the tree. I do think, however, that in some cases, we can actually improve on nature and I believe in connection with apple pomace, we can do this by composting it.

●

*EARTHWORMS — COFFEE GROUNDS*

Dear Sir:

There is one type of refuse from the kitchen that has helped me some years ago in raising worms, for fishing bait when I was a boy.

I could never raise them successfully until a man told me about coffee grounds. I kept the worms in a fair sized wooden box about half full of soil. On top of this he told me to sprinkle coffee grounds, and not to be afraid to add to them from time to time. I found this to work out very well.

I would like to know what effect caffeine would have if coffee grounds are mixed in the compost?

Edw. A. Pleche,
Villa Park, Ill.

*Answer*

Dear Mr. Pleche:

Replying to your letter of September 12th, coffee grounds are considered excellent for feeding earthworms. They seem to thrive and multiply profusely wherever a mulch of coffee grounds is placed on soil. I do not think that you need to worry regarding the caffeine in the grounds. I imagine that most of it has already been drained out in the process of making coffee. Experiments show that it does not do any harm to earthworms, and should also be safe for the compost heap.

●

*WEEDS—OLD*

Gentlemen:

I have some very old piles of weeds, may they be used in the compost heap?

Bill Mud,
Durham, N. C.

*Answer*

Old weeds and grass, even a year old, is good for composting, on the other hand, manure of such age would not be, because the process of fermenting would be retarded, due to the fact that old manure does not bring the inside of the heap to the required temperature of about 160° Fahrenheit.

●

*COMPOST—GRUBS*

Dear Sir:

In sifting compost I find a lot of what I call grub worms. For

*been told that they are the breeders of a lot of insects that bother garden vegetables. Is this true? Should they be killed if this is so, before compost is put on soil and raked in?* That is the method I am using.

Fred F. Winkler,
Alton, Ill.

*Answer*

Dear Sir:

Regarding what you call grub worms in the compost heap, they are no doubt the eggs of flies, which are sometimes found when a compost heap is started and there is animal matter present. They usually disappear in a short time and are no problem if the compost heap is made correctly. If you can conveniently remove them, or sift them out, do so.

●

## *LEAVES—MAGNOLIA*

Dear Sirs:

Your inquiry about Magnolia leaves, August issue page 21 caught my eye and reminded me that I had used the leaves from Magnolia Soulangeana as a mulch under a Rhododendron last Fall. Inspected this spot this morning and find the leaves in about the same stage of decomposition as oak leaves have been heretofore; incidentally a few hard maple leaves were in the same pile and seemed to be in the same condition as the Magnolia leaves, just enough shape left to them to recognize the species. The leaves were piled in about 18 inches deep and forgot until this morning. What now remains is about one inch of recognizable leaves. The place is protected against wind but not from rain and air.

Bernice M. Nulsen,
Kirkwood, Mo.

EDITOR'S NOTE:—The previous inquiry was whether Magnolia leaves would decay in a compost heap as they seem to be so heavy and leathery.

●

## *WEEDS—THEIR BIOLOGIC ASPECT*

Does it pay to keep the garden well-weeded all the time?

*Answer*

There are certain things that will always be with us such as death, taxes and weeds. A garden that grew no weeds would yield no vegetables. They serve a valuable purpose. Weeds capture valuable food elements from the soil that might otherwise leach away. When they decay this is returned to the soil. Their roots furnish valuable organic matter to the soil when they die. It is not generally known that a plant secures less than 10% of its nourishment from the soil. Weeds get 90% of their food from the atmosphere and when they die, the soil gets the benefit of it. For these reasons a new school of thought has evolved which believes that weeding your garden so that it resembles a drawing-room is not in the interest of its maximum fertility. Too much however is too much and weeds, therefore, must be kept within reasonable bounds.

The ordinary gardener looks at his patch run riot with weeds and it holds no meaning to him, but there is a valuable message there. For example an acid soil encourages certain weeds to grow. This includes sorrel, red top, daisies, purslane, hawkweed, dewberries and broom sedge. Broom sedge flourishes quite profusely when a farm is so rundown that it is ready to be abandoned. I have noticed purslane growing in some of our

**STONE GROUND GRAINS**

NATURAL Whole Grains and Cereals ground into FLOURS and Meals on our Water Driven French Buhr Stones. Send for FREE list of products.

NOTE:—We have purchased a small quantity of organically raised corn from the experimental farm of ORGANIC GARDENING Magazine which is now available in the form of corn meal. (Free recipes included).

**GET YOUR VITAMINS DIRECT from NATURE**
**OUR-HONEY GERM**
**A Delicious Cold Breakfast Food Made From Wheat Germ and caramelized sweet potatoes is Rich in Vitamins A, B, C, E & G.**
**Send $1 for 3 pounds,**
(parcel post price)
(Add 15c west of Miss. River)
**GREAT VALLEY MILLS, Paoli, Pa.**

Great Valley Mills, Dept. O. G., Paoli, Pa.
Please find enclosed $.....
Send ..... pounds Honey Germ to:
Name .....
Address .....

**Gifts** ★ HUNDREDS ★ OF UNUSUAL GIFTS
FROM THE WHOLE WIDE WORLD
Scotland, England, Switzerland, China
Cape Cod, Hollywood, South America, etc.
The NEW Catalogue of Kellogg Selections is full of inspirations and surprising "Finds," all pictured and described for you. Inviting prices.. the majority under $5. Each article is attractively wrapped and comes to you prepaid with our guarantee of your complete satisfaction.
Write NOW for your FREE Copy
Robert W. Kellogg Co.
Spring Field Mass
50 Hillman St.

**Michigan Peat**
Natures finest SOIL BUILDER Improves all Soils. Excellent for lawns, trees, shrubs. Inquire Dealer or:
American Soil Sponge Selling Corp.
267 Fifth Ave., New York City.
Dept. O.

# AN AGRICULTURAL TESTAMENT

SIR ALBERT HOWARD C. I. E., M. A.

By Sir Albert Howard, C.I.E., M.A.

Formerly Director Institute of Plant Industry Indore, and Agricultural Adviser to Central India and Rajputana.

This is a remarkable book published by the conservative Oxford University Press. It gives the complete history of Sir Albert Howard's development of his process of making compost. It describes the events in The West Indies and India that led up to his epoch-making discovery. After reading this amazing book, if it does not thoroughly convince you that the organic way is the best your money will be cheerfully refunded. Many gardeners date their conversion to the organic method from the time of reading this Testament.

CONTENTS


1 Introduction

Part I

The Part Played By Soil Fertility In Agriculture

2 The Nature of Soil Fertility
3 The Restoration of Fertility

Part II

The Indore Process

4 The Indore Process
5 Practical Application of the Indore Process
6 Developments of the Indore Process (A)
7 Developments of the Indore Process (B)
8 Developments of the Indore Process (C)

Part III

Health, Indisposition, and Disease in Agriculture

9 Soil Aeration
10 Some Diseases of the Soil
11 The Retreat of the Crop and the Animal Before the Parasite.
12 Soil Fertility and National Health

Part IV

Agricultural Research

13 A Criticism of Present-day Agricultural Research
14 A Successful Example of Agricultural Research

Part V

Conclusions and Suggestions

15 A Final Survey

Appendixes


This is the recognized standard text book for gardeners and farmers who wish to change from the use of ordinary chemical fertilizers to home-made organic fertilizers. Sir Albert Howard has forty years of active experience in the field of organic fertilizers and is the accepted leading authority on the subject.

We have arranged to print this book in the United States and have been able to reduce the price to ....

**$3.50**

**Postpaid**

Canada and Foreign—35c extra.

**Organic Gardening**

**Emmaus, Pa.**